

AVIATION AND AERONAUTICAL ENGINEERING



Photo by Wyndham

Georges Carpentier, French Aviator, Standing in Front of a Twin-Engine Warplane

(C) Bate News Service

JANUARY
1st
1917

SPECIAL FEATURES

THE PRESENT DAY AVIATIK
AGREEMENT FOR MANUFACTURING UNDER WRIGHT PATENTS
METHOD OF ALIGNING SINGLE-ENGINED TRACTOR BIPLANES
SECRETARY DANIELS OUTLINES NAVAL AIR POLICY
COURSE IN AERODYNAMICS AND AIRPLANE DESIGN
COMMITTEE HEARINGS ON NAVAL AERONAUTICS
THE PAN-AMERICAN AERONAUTIC EXPOSITION

PRICE
Ten
Cents

PUBLISHED SEMI-MONTHLY
BY
THE GARDNER, MOFFAT CO., Inc.
120 W. 52nd ST. NEW YORK



AVIATION TRAINING

THE CURTISS School of Aviation will give training this winter, in Florida, to those civilians who may be accepted by the Aviation Section, U. S. A., upon their having made application for enlistment in the Aviation Reserve Corps. Applicants must be between twenty-one and twenty-seven years of age, possess good health, character and college education or equivalent. Tuition will be paid by the Government.

FOR FURTHER INFORMATION WRITE

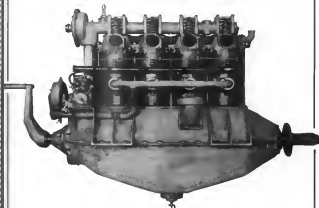
THE CURTISS TRAINING SCHOOLS

CHURCHILL STREET, BUFFALO, N. Y.

Curtiss

Curtiss

HALL-SCOTT



The Hall-Scott four cylinder, vertical, 90-100 H P equipment, has been especially built to meet the requirements for Army and Navy training and light scouting airplanes. The simplicity and sturdy construction of the engine, together with assurance of smooth and steady power output particularly adapts it for the use intended.

This engine is offered, after undergoing the regular series of running tests at the Hall-Scott Plant and satisfactory tests in airplanes under actual flying conditions.

Type A-7 : 90 H P.

Type A-7a : 100 H P

HALL-SCOTT MOTOR CAR CO., Inc.

General offices:---818 Crocker Bldg., San Francisco, Calif.

Eastern representative: F. P. Whitaker, 165 Broadway, N. Y.



A section of the engine department



A detail of the engine shop

THE facilities of the B. F. Sturtevant Company for designing and manufacturing engines and other high grade mechanical devices are unsurpassed.

Sturtevant

INCORPORATED
B. F. STURTEVANT COMPANY
Hyde Park, Boston, Massachusetts.



One of the machine shops



The engine assembly room

EXPERTS see that every detail of construction is carried out, thus securing the maximum reliability, endurance and efficiency in the finished product.

Sturtevant

INCORPORATED
AEROPLANE COMPANY
Jamaica Plain, Boston, Mass.

THE NEW WATER SPORT OF THE SUPERMAN

Instruction
in a General Aeroplane Co's Verville Type
Flying Boat will convert the ardent
speed motor boat enthusiast to the
virile man making sport of flying

"PREPAREDNESS"



Office ~
 1507 East Jefferson Ave.

GENERAL AEROPLANE CO.
 Detroit U.S.A.

Hangars
 Old Detroit Motor Boat Site



Three Standard Model B-3 Tractors at the Signal Corps Aviation Station, Monroeville, L. I., Designed by Charles H. Day.

The *Standard* of Excellence of the *Standard* Aero-planes and Hydroaero-planes is due to the Superiority of *Standard* Design, to the Quality of *Standard* Material and to the Efficiency of *Standard* Workmanship.

Contractors to the United States Government.

STANDARD AERO CORPORATION
 of NEW YORK

EXECUTIVE OFFICES
 Woodworth Building, New York

FACTORY
 Plainfield, New Jersey

First Pan-American AERONAUTIC EXPOSITION

HELD UNDER THE AUSPICES OF

THE AERO CLUB OF AMERICA
THE PAN-AMERICAN AERONAUTIC FEDERATION
THE AMERICAN SOCIETY OF AERONAUTIC ENGINEERS

THE EXPOSITION WILL COMPRISE THE MOST UP-TO-DATE PRO-
DUCTS OF THE AMERICAN AERONAUTIC INDUSTRY AND INCLUDES:

THE ARMY AND NAVY AERONAUTIC
EXHIBITS
NATIONAL GUARD AND NAVAL
MILITIA SECTIONS
NATIONAL ADVISORY COMMITTEE FOR
AERONAUTICS' EXHIBIT
AERO CLUB OF AMERICA AND PAN-
AMERICAN AERONAUTIC FEDERA-
TION SALONS
AERO COAST PATROL EXHIBIT.
AMERICAN SOCIETY OF AERONAUTIC
ENGINEERS (Standardizing section).
INTERCOLLEGIATE SECTION

AERO MAP AND LANDING PLACE EX-
HIBIT
WEATHER BUREAU EXHIBIT
BUREAU OF STANDARDS EXHIBIT.
PAN-AMERICAN UNION EXHIBIT OF RE-
LIEF MAPS, ETC.
COAST GUARD EXHIBIT
POST OFFICE EXHIBIT OF MAPS AND
LOCATIONS OF 296 PROPOSED AERIAL
MAIL ROUTES
SMITHSONIAN INSTITUTION EXHIBIT
DIRIGIBLE BALLOONS
BALLOONS
MOTION PICTURE HALL

GRAND CENTRAL PALACE NEW YORK CITY FEBRUARY 8 to 15, 1917

Address all Communications to HOWARD E. COFFIN, Chairman
PAN-AMERICAN AERONAUTIC EXPOSITION, 297 Madison Avenue, New York
Telephone Murray 3611, 35-32
ADMISSION 50 CENTS

JANUARY 1, 1917

AVIATION AND AERONAUTICAL ENGINEERING

VOL. I. NO. 11

INDEX TO CONTENTS

	PAGE		PAGE
Aerial Photographs on the Spanish Front	352	Course in Aerodynamics and Airplane Design	360
Editorials	353	Aeronautical Patents	362
The Present Day Aircraft	354	Committee Hearings on Naval Aeronautics	363
Agreement for Manufacturing Under Wright Patents	357	The S. A. E. Meets on January 11	363
A Method of Aligning Single-Engined Trans- port Biplanes	358	The Pan American Aeronautics Exposition	364
Secretary Daniels Outlines Naval Air Policy	359	Two Views of the L-W-F Biplane	364
		Pennsylvania Notes	366

THE GARDNER, MOFFAT COMPANY, Inc., Publishers
120 WEST 32d STREET NEW YORK

SUBSCRIPTION PRICE: ONE DOLLAR PER YEAR. SINGLE
COPIES FIVE CENTS. CANADA AND FOREIGN: ONE DOLLAR
AND A HALF A YEAR. COPYRIGHT 1917 BY THE GARDNER,
MOFFAT COMPANY, INC.

ISSUED ON THE FIRST AND FIFTEENTH OF EACH MONTH
FORMS CLOSE FIVE DAYS PREVIOUSLY. ENTERED AS SECOND-
CLASS MATTER AUGUST 3, 1914 AT THE POST OFFICE AT NEW
YORK, N. Y. UNDER ACT OF MARCH 3, 1879

Every Pilot Can Keep a Straight Course

by Using the

SPERRY SYNCHRONIZED DRIFT SET

Including Compass and Telescope
which Operate Simultaneously

Saving

TIME—By Reducing the Period Required for Flight.
GAS—By Diminishing the Distance that otherwise
would be Traveled.

THE SPERRY GYROSCOPE COMPANY

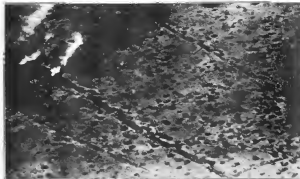
Manhattan Bridge Plaza
Brooklyn, N. Y.
TELEPHONE 796 MAIN

Rue Baluy d'Anglais—18 Cité du Refuge, Paris

15 Victoria Street, London, S. W.



THE VILLAGE OF BOPPEMUND



THE VILLAGE OF BOPPEMUND

Two views of the French attack on the suburbs of the village of Boppefund. The two aerial views are in German hands. Troops are plainly visible in many of the trenches and shell-craters are shown in both photographs.

THOMAS EDWIN
LESTER D. GARDNER
MORRIS BROWN
WILLIAM J. HARRINGTON

AVIATION AND AERONAUTICAL ENGINEERING

THOMAS EDWIN
A. KLEMM, A.C.E., Editor
Lecturer in Aeronautics
Massachusetts Institute of Technology
MORRIS BROWN
HERBERT M. WILLIAMS, B.S.

Vol. 1

January 3, 1917

No. 12

IN THE ISSUE OF AVIATION AND AERONAUTICAL ENGINEERING, the Wright-Martin Aircraft Corporation business agreement is printed. The Curtiss Company has also needed construction that it will expect royalties for the building of airplanes under its patents. Until this question of basic patents is fully determined, the aeronautical industry in this country will be in an unsettled condition. For this reason, the matter is enlarged, the better for the owners of the patents, the construction and the Government.

There are four parties to consider: the Government, the owners of the patents, the possible business, and the Government. The latter has a direct interest as the chief purchaser of airplanes in this country, and as the ultimate consumer who will have to pay the royalties. The possible business will have to determine the probable validity of the patents, while the owners of the patents will naturally make every effort to exact what is their judgment as a fair royalty.

It is unfortunate that no advantage was taken by opportunity on the Government of its generous offer which the Wright Brothers made in 1907 to sell their patents for public use for \$500,000. It is another lamentable instance of short sightedness in dealing with such important inventions. Today conditions have altered. Aeronautics is thought of in large figures.

When elements were considered in comparison ten years ago military air was regarded as inadequate for this or that purpose, important areas of military and naval warfare. Large investments have been made in the industrial development of airplanes and accessories. Reaching the ultimate scope of the industry, seen in the most efficient, tall business men in the country, have become interested in the construction of airplanes and accessories. The future is to be that of big business.

The proposed agreement calls for business and the payment of royalties. Five per cent on the gross business is offered for the use of the Wright patent. The Curtiss royalty has not been mentioned as yet. There seems to be a general agreement that some payment would be for the situation and enable constructors to operate knowing their position clearly.

The whole problem then resolves itself into a question as to whether it is preferable to litigate or pay a royalty. As the agreement is not to be a business, the volume of business to be considered is from 1916 to 1923. With the five per cent royalty, on the gross business, an average business of \$50,000 a year is asked. This means that a concern will have to do a gross business of \$200,000 a year to operate on this percentage as a fixed rate.

It is probable that these two firms will be more discriminated than any others. Whether or not five per cent on the gross business is excessive is a matter of cost

accounting which will have to be determined by each constructor. The owners of the patents will have to determine what protection from unfettered competition they can guarantee to business. The amount of \$10,000 is also a most serious proviso, for many concerns could be deterred from entering the field with this annual payment definitely demanded.

It is quite probable that the Government will take some part in the settlement of this patent case. The Navy particularly has had many patent difficulties to meet and has managed to adjust them in the satisfaction of patent owners. At the present time, it is merely a matter of adequate compensation. England reached an agreement with the Wrights and it would be unfortunate if the present momentum of this country for aerial progress were stopped by delays in such or negotiations of a prolonged nature.

It is clearly a time for all interests to get together and make a settlement so that the Army and Navy will be no equipment so urgently needed.

Aeronautics Is Now Favorably Considered

THE HISTORY of the congressional domination on appropriations for aviation has been a long one. It has already shown that since 1910, a marked change in sentiment has taken place in Washington. A like condition is apparent in many different ways throughout the country, and the people as a whole are realizing the great progress being made in aeronautical development.

At the recent hearings government aviation officials stated that their helpful policy of cooperating with constructors and other members has resulted in decided advances in the industry and promises to be an important factor in placing it on a firm business basis. Just as much is heard from the officials of the airplane and motor men being handicapped and it is evident that confidence is felt in the future of the products of the leading American aeronautical manufacturers.

The year just closed has been notable for the successful development of the industry and for the creation of a popular interest in aeronautics. The new year is bound to develop increasing general interest, and to yield advance in designing, better manufacturing facilities, and much greater factory output. The year 1917 will be a period of real expansion and systematic production in a commercial sense will be undertaken on a broader scale.

AVIATION AND AERONAUTICS. Some time ago, through its efforts in presenting technical information, it will in some measure assist the growth of this new industry on which the Nation is dependent for its protection and its peace.

By Jean Lagorgette

The present Aviatiks are tractor biplanes with stream-line bodies. These dimensions are practically the same as those of all German biplanes whose evolution they followed. After having a wing spread almost double the length of the airplane, the wings were shortened, while the length of the body remained the same.

WINGS

The incidence of the wings to the propeller axis is 4 degrees 38 minutes throughout their spread, and there is no dihedral. The planes since 1915 now had only a very slight dihedral.



FIG. 1 AVIATIK OF 1909 TYPE.

The photograph shows the increased motor horsepower which forced vertical fins, wings almost vertical instead of swept back and reference to the upper planes.

about half a degree. As seen from above as in Fig. 3, their shape is practically rectangular, almost forming a parallelogram. The sweep back is much more than 2 degrees 19 minutes. On the last rotated Aviatik, the sweep back has been almost entirely eliminated. The spread of the upper wings is 48 feet 8.1 inches, while that of the lower ones, including the body, is 35 feet 3 inches. The chord measuring 8 feet 2 inch, and the gap of 6 feet 4 inches, is slightly greater than in the other German airplanes. The total surface of the wings is 429.63 square feet, including the surface of the ailerons.

The ailerons are fitted only to the upper planes, and their outer edges rise progressively near the ends of the wings, as will be seen by referring to Fig. 1. Each aileron measures 7 feet 10 inches by 2 feet 5.1 inches, and has an actual surface of 17.62 square feet. Like the wings, they are shorter and



FIG. 2 FRONT ELEVATION OF THE TYPE AVIATIK IN SERVICE AT THE PRESENT TIME.

more compact than they formerly were, and though not as extended, are deeper.

TAIL.

Like all German airplanes, the Aviatik has a large fixed stabilizer, which measures 4 feet 9.2 inches by 9 feet 2.2 inches. Its shape, almost a perfect half circle, is in the old model and the first incidence of the horizontal control bar, has disappeared in 1915. The tail is a slightly lifting one, and is similar to that of the new Albatros.

Formerly, the upper surface of the body upon which rested the stabilizing plane was in line with the axis of the engine, but making a slight angle with the fixed stabilizer. Now its body slopes downward at the rear, but the angle of incidence of the stabilizer is unchanged. Its angle of incidence to the wing is now 3 degrees 55 minutes, and the extremity of the stabilizer axis passes 0.55 inches behind the rear of the stabilizing plane.

The elevator is composed of two semi-circular surfaces between which the rubber is stretched, as shown in Fig. 1. The dimensions of this surface are 4 feet 3 inches by 2 feet 2 inches.

The rubber, which was originally shaped like a comma and without any fixed fin, later, in the 1914-15 type, became semi-circular with a fixed fin. It has now returned to its comma

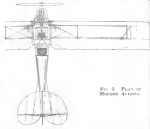


FIG. 3 PLAN OF MODERN AVIATIK.

shape, with a slight inclination to align of the fixed fin, which measures 3 feet 1 inch by 3 feet 5.5 in. and is set at an angle. The dimensions are: Height, 3 feet, depth, 2 feet 3.3 in. and, the balancing part, 10.63 inches to the depth.

The surface area of the elevator is 12.67 square feet, while the surface area of the fixed stabilizing plane, including the part covering the body, is 35.52 square feet. The surface area of the rubber is 4.45 square feet, surface of the balancing part, which measures 31 square feet on surface area. The surface area of the stabilizer fin measures 3.22 square feet.



FIG. 4 SIDE ELEVATION OF 1909 MODEL AVIATIK.

The elevator, the rubber and the fixed vertical fin are built up of hollow steel tubing of 1/2 inch outside diameter. The edges of the elevator stabilizer are of 3/8 inch hollow steel tubing, and its ends are of wood. The front edges of the elevator surface are also of 1/2 inch hollow steel tubing.

The streamer stabilizer is fitted to the extreme rear end of the body, and is set back into the body as it is on the L.V.G. It is supported from below by four small tubes and connected with the fixed fin by two others. The tube constituting the outer part, outside of the extremity of the body, rests on a sort of step, as in the Albatros and the L.V.G.

TAIL.

The length of the body is 12 feet 2 inches, is practically the same as that of the Albatros and of the Bleriot. It is built with box girder construction, rectangular in cross section, with diagonal stays of piano-wire. The whole is assembled, as before the war, with painted cotton and oil-spraying, which is done with all severity of painting the longitudes. These oil

are impregnated and held in place by screws with two ends bent up and held together to take transverse or external wires after the gaps, extending from the gaps on the inside of the longitudes and turned up are used for fastening the other one. Details of the fittings used are shown in Fig. 6.

The body has a good stream-line form, more slender than it formerly was. The two lower wings are attached directly to

level with the pilot's seat, and are narrowed together at a point 3 feet 3 inches behind the pilot's seat. The ailerons and cross members are of pine.

The top of the body is covered with arched plates, which, like those of the body, are made of aluminum. The seat of the body is covered with fabric. The floor of the cockpit is made of aluminum plates. There are folding steps inside, none outside.

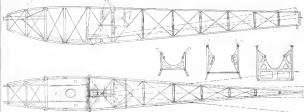


FIG. 5 PROFILE AND PLAN OF THE BODY OF THE TYPE OF AVIATIK NOW IN USE.

The main illustration shows steering column and rubber bar with control wires. The small diagrams show engine bed construction and supports.

the body on the sides and slightly above its lower edge. A hollow steel tube running through the body transversely, as shown in Fig. 5, is extended by a steel rod, 1 inch and 1/2 in. passed inside the two wings, a that are part of the steel fitting that envelopes the end of the wing spar. A key of olive shape, not movable from front to rear, locked by a spring, passes through the two holes, A and a hole in end of it, and holds the wing securely to the body.

The two upper wings are assembled to one another in a similar manner on vertical tubes supported by the body. There is no space gap between them.

The cockpit is built of rolled steel tubing, with the two rear ailerons attached backward more than formerly, the slight loop to facilitate the working of the machine gun, which now is about in the cockpit instead of at the back of it as in the L.V.G. The top frame of the cockpit is a round tube, and the four corners are taken of elliptical section.

Rubber connecting the rubber and elevator with the wings and carrying the landing gear, the body holds the engine in bed. A large part of the cylinder proper outside of the head.

Level with the wings and between the main gasoline tank the passenger sits on a folding seat (the two variable weights, passenger and fuel, being near the center of gravity, have little influence on longitudinal equilibrium). Although seated and made the body behind the engine, so that his vision is certainly interfered with, the passenger is rather poorly protected from the wind. The pilot, however, is comfortably seated in a rubber armchair with velvet upholstery. A wide rectangular window enables him to see immediately inside the machine.

The body is made almost wholly of wood. As in all German biplanes, the four main members are of such springs with flaps from the front of the machine to the back of the rear seat, and from there on of non-sprung parts. The joints are riveted and strapped. As in the L.V.G., and contrary to the Albatros practice, the four longitudes of the Aviatik extend their maximum thickness right up to the bow, where the bed for the engine is supported by two cross members, and between them cross members by a thin bracket or other rod. The two upper longitudes curve downward sharply at a point

LANDING GEAR. The landing gear has remained almost identically what it was prior to the war. It is composed of two V's of alumin tubing well spread outward, and with the two supporting members supported at the bottom by a round tube fixed with wooden stream-line members.

The landing gear is built in shape by a cross member of elliptical tubing, horizontal cables and steel cable cross-stays.

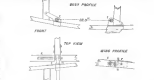


FIG. 6 DETAILS OF WING FITTINGS.

The side view inside of the mouth of the two V's and is clearly attached to the cross member of which Fig. 6 shows the greater arrangement.

On recent Aviatiks, due to the lack of rubber, the landing gear is different. It has returned to the type used in France and Germany, but the "Sandow" rubber cords are replaced by three long spiral springs set one inside of the other. ("Albatros" had a shock-absorbing coils "taking the place of rubber.") The tread remains very broad, 6 feet 2.15 inches.

Most of the tubes in the Aviatik, notably the tubes of the landing gear, and of the struts, are externally reinforced with wood. This is not the case with other biplanes.

* A digest of an article in L'Aéronautique.



Resilient and Light

In the shock of rough workmen by Mother Earth, it is good to know that Goodyear Cord Tires are under your plane.

The cord construction gives these resilient and strength to withstand the terrific shock of landing on rough, uneven ground—and a factor of safety greater than that of any other aeroplane tire.

The light and very strong Goodyear Rims to which they are tightly attached, insure against slipping off, even when the landing shock flatters them out.

The reputation which extensive use has given them both here and abroad is not due merely to the fact they are the only cord tire made for aeroplanes.

The superior workmanship and excellent materials have played no small part in the winning of these great races, just as they have established in favor everything made of rubber which Goodyear supplies for aeroplanes or balloons.

Send us your requirements.

The Goodyear Tire & Rubber Co.
Akron, Ohio

GOODYEAR

Pennsylvania Notes

First arrivals of a new class of twelve officers to go to training at the aviation station have already commenced work at the school, and others are expected daily. Several officers of the naval aviation are also under instruction, and more ships are being made. Some of the officers previously stationed are undergoing examinations for promotion.

Students now, I learn, sometimes have arrived from the far West, after completing their flying at the school, and as being tested by Lieutenant Phillips Butler, pending assignment. Later, Butler was awarded with the Allied Aviation Corps, or Zeppelin duty over London. His experience in Europe, and his long and successful work in aviation, and his superior performance, are viewed with more than the usual interest both in naval and military circles.

A ship, according to the flight of Lord Spencer is ready while testing a new machine, when, and before starting, as the number of the ship, the machine under a new design, and the ship was ready and the machine was slightly damaged. A first speed boat and two airplanes were tested in the water, and the second machine tested in the air.

A number of flights have been made with five balloons, the work being under the supervision of Lieutenant Commander F. H. McHenry. Since a successful completed the first in flight, an all-right flight has not been tried, though many days flights have been made.

Hermann Aircraft Motors Incorporated

Hermann Motors Co. of South Glenside, Penn., has just been incorporated for \$125,000, and with headquarters in the city of Philadelphia. The company will be in the past, manufacturing the standard airplane motor, and many new and up-to-date aviation parts, in view from 1915, the company.

The plant for the present will remain at South Glenside, but will be enlarged. New buildings will be erected and the necessary machinery will be provided for at once. Orders are in sight for over 100 motors of various sizes.

Beam School of Aviation

Offers rarest opportunity of all

New Aeroplane, exhibition type ready for motor, given to the student out of each class of ten getting his license after least number of minutes training.

**FACTORY EXPERIENCE
RAPID INSTRUCTION**

No charge for breakage.
Board and room very reasonable.

*Instruction under Billie Brock
and Monte Rolfe, Loopers*

Beam School of Aviation
Celina, Ohio

Radium Compound No. 6

Is specified in United States Government
"Aeronautical Specification No. 1002." For

Illuminating

Barometers Clocks Compasses
Speed Indicators Inclometers, etc.

WE ALSO MAKE OTHER GRADES OF RADIUM COMPOUND

Send us an instrument for specimen treatment

Radium Chemical Company

Forbes and Myran Aves.

Pittsburgh, Pa.

CHRISTOFFERSON MOTOR CORPORATION

Aeronautic Motors

CHRISTOFFERSON AIRCRAFT MFG. CO.

**Military and Sporting
Land and Water Aeroplanes**

NEW YORK
61 Broadway

School and Factory
REDWOOD CITY, CAL.

SAN FRANCISCO
57 Post Street

Aero Club of Pennsylvania

At a recent meeting of the Aero Club of Pennsylvania, a large audience listened to Major William Mitchell, U. S. A., lecture on "Military Aviation." Aviation conditions in America are some times in Europe because of our geographic situation and climate, according to Major Mitchell.

Personal criticism such as is shown and interpreted of undisciplined and added to the difficulty of working and doing things. He said, "There is too much of the tendency of the officers to be as in a school room."

Every thing is in the hands of the officers with no room for the soldiers. Officers have been placed for a number of years at a speed of 125 miles an hour and used with one machine gun. We have also to get a small plane in the next future capable of over 150 miles an hour. Despite the recommendations of all are under consideration by the War Department engineers have been unable so far to duplicate the power standards and needed for their machinery.

Logicians and aviation instructors are also badly under Major Mitchell criticism. "Few of the officers know so properly their own job as they do."

The annual meeting of the club and election of officers will be held in the Bellevue-Stratford on the evening of January 10, and a large attendance of members is specially requested.

Aero Radiator Used on Max Holt-Scott Engine

A radiator version, claimed by the manufacturer to be third lighter and to consume more water than other aviation radiator systems, is made by the Aero Sheet Metal Job Shop Company, 345 West 44th Street, New York. The Aero Company, Inc., under construction 85 of these radiators for the Holt-Scott Company, the Standard Aero Corporation and the Aeromarine Sales and Engineering Company. The company is making exhaust and intake manifolds, for engine repair and has orders for cars without manifolds for engines which will drive the new models, designed to develop 44 horse power hour which the Army will use as engines for the two engine airplanes it has ordered.

Fahrig Anti-Friction Metal

The Best Bearing Metal on the Market
A Necessity for Aeroplane Service



Fahrig Metal Quality has become a standard for reliability. We specialize in this one-on-copper alloy which has superior anti-friction qualities and great durability and is always uniform.

When you use a speed or distance record broken by Aeroplanes, Racing Automobiles, Truck or Tractor Motors, you will find that Fahrig Metal Bearings were in that motor.

FAHRIG METAL CO., 34 Commerce St., N. Y.



The Standard Dope for Aeroplane Surfaces

DuPont Dope is used on over 90% of the machines built in this country for U. S. and foreign governments.

DuPont Dope deposits a tough, flexible, and waterproof film that imparts great strength to the fabric, with correct shrinkage.

DUPONT CHEMICAL WORKS

8, J. de Paris de Rouen & Co. France

120 Broadway

New York



AJAX
Auto and Aero
Sheet Metal Co.

Manufacturers
and designers
of

**AERO
RADIATORS
INTAKE
and
EXHAUST PIPES**

LINDER & MEYER
240 W. 34th St.
New York



Factors of Safety

These Count in Aeroplane Construction

NON-INFLAMMABLE

Cellulose Acetate Base

Celestron Cloth Varnishes

provide another SAFETY FACTOR

NON-INFLAMMABLE

Celestron Sheets AND Films

Transparent — Waterproof

MANUFACTURED BY

Chemical Products Company

U. S. Broad Street

Boston, U. S. A.

Manufacturers of Cellulose Acetate for nearly 15 years

AIRPLANE SUPPLIES

Engines,
Pumps,
Turbines,
Wheels,
Tanks.



Propellers,
Motors,
Ribs,
Struts,
Steering
Controls.

THANKS FOR OUR BUSINESS

CHICAGO AERONAUTICAL SUPPLY CO.
CHICAGO — ILL.

Aeroplane Linen

Used by the BRITISH GOVERNMENT
in their Air Service; also by the UNITED STATES GOVERNMENT and
Large Aeroplane Manufacturers

Large stocks on hand.

Samples and Specifications sent on application.

Robert McBratney & Company

Linen Manufacturers & Importers
121-123 Franklin Street, New York
and at Belfast, Ireland

RADIUM LUMINOUS
MATERIAL

Conforms with all specifications for

Compass

Altimeter

Stroboscope

Climometer



Assault

Oil Gauge

Aerometer

Monometer

SEES AT NIGHT

GUARANTEED LIFE

We will demonstrate one of your own instruments without charge if you will send it to us

Radium Luminous Material Corp.
55 LIBERTY STREET NEW YORK

Sample of material sent on request

FOXBORO

AIR SPEED
INDICATOR

Forewarns and
Prevents Stalling

Accurately indicates the velocity
and pressure, the more this
indicator the closer to stall the
engine and propeller.

Model No. 1000

Send for Bulletin No. 1000



THE FOXBORO CO., Inc.
FOXBORO, MASS., U. S. A.

New York

Chicago

San Francisco

DILLNER-MEYER MFG. CO., INC.
SUCCESSORS TO A. J. MEYER CO.

Airplane Turnbuckles and Fittings of
Uniformity, Toughness and High
Resistance to Crystallization

SCREEN MACHINE PRODUCTS OF EVERY DESCRIPTION

819-821 John Street
WEST BURGESS, N. J.

Wright-Martin Aircraft Corp.

Owns all the stock of

The Wright Company
Glenn L. Martin Company
Simplex Automobile Company
Wright Flying Field, Inc.
General Aeronautic Company of
America, Inc. (*Export Company*)

Location of Plants

Western aeroplane factory
Los Angeles, Cal.
Eastern aeroplane factory
Site now being selected near New York
Experimental aeroplane factory
Dayton, O.
Aviation motor factory
New Brunswick, N. J. (Simplex Works)
Western flying field
Los Angeles, Cal.
Eastern flying field
Hempstead Plains, L. I.
Hydroaeroplane station
Port Washington, L. I.
Total men employed, 2362

Capital Stock

7% cumulative convertible preferred,
\$5,000,000. Common stock, of no par
value, 500,000 shares

Officers

Edward M. Hagar, President
Glenn L. Martin, Vice-President
C. S. Jennison, Vice-President
James G. Dudley, Secretary and
Treasurer
Gordon Wilson, Comptroller
A. H. Hudson, General Purchasing
Agent

Counsel

Chadbourn & Shores, General Counsel
Fish, Richardson, Herrick & Neave,
Patent Counsel

Directors

Frederick B. Adams
Of Potter, Choate & Prentice
Frederic W. Allen
Of Lee, Higginson & Company
John F. Alvord
President, Hendee Manufacturing Company
T. L. Chadbourne, Jr.
Of Chadbourne & Shores
Harvey D. Gibson
President, Liberty National Bank
Robert Glendinning
Of Robert Glendinning & Company, Philadelphia
David M. Goodrich
Director, B. F. Goodrich Co.
Edward M. Hagar
President, Wright-Martin Aircraft Corporation
C. S. Jennison
Henry Lockhart, Jr.
Goodrich-Lockhart Company
N. Bruce MacKelvie
Of Hayden, Stone & Company
T. Frank Manville
President, H. W. Johns-Manville Company
Glenn L. Martin
Vice-President, Wright-Martin Aircraft Corporation
S. F. Pryor
Vice-President, Remington Arms-Union Metallic Cartridge Company
W. Hinckle Smith
Of Philadelphia
Henry R. Sutphen
Vice-President, Submarine Boat Corporation
Harry Payne Whitney

Offices

Main Office, 60 Broadway, New York City
Western Office, 937 S. Los Angeles St.,
Los Angeles, Cal.
Foreign Office, 35 bis Rue d' Anjou,
Paris

60 BROADWAY, NEW YORK CITY